



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/769,554	01/30/2004	Chien-Min Sung	21154.DIV	5868
20551	7590	03/22/2006		
THORPE NORTH & WESTERN, LLP. 8180 SOUTH 700 EAST, SUITE 200 SANDY, UT 84070			EXAMINER PIZARRO CRESPO, MARCOS D	
			ART UNIT	PAPER NUMBER
			2814	
DATE MAILED: 03/22/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/769,554

Applicant(s)

SUNG, CHIEN-MIN

Examiner

Marcos D. Pizarro-Crespo

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 February 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 and 20-30 is/are pending in the application.
- 4a) Of the above claim(s) 2,3 and 22-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-15,20 and 21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-15 and 20-30 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Application/Control Number: 10/769,554 (Non-Final Rejection)
Art Unit: 2814

Page 2

Attorney's Docket Number: 21154.DIV

Filing Date: 1/30/2004

Claimed Priority Date: 10/11/2002 (Divisional of 10/270,018)

Applicant(s): Sung

Examiner: Marcos D. Pizarro-Crespo

DETAILED ACTION

This Office action responds to the amendment filed on 2/27/2006.

Continued Examination Under 37 CFR 1.114

1. A request for a continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after the final rejection mailed on 11/29/2005. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/27/2006 has been entered.

Acknowledgment

2. The amendment filed on 2/27/2006, responding to the Office action mailed on 11/29/2005, has been entered. The present Office action is made with all the suggested amendments being fully considered. Accordingly, pending in this Office action are claims 1-15 and 20-30.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 4, 7, 11, 20, and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Ishikawa (WO 01/48816).

5. Regarding claim 1, Ishikawa shows all aspects of the instant invention including a method of making a diamond composite heat spreader comprising the steps of:

- Providing a first plurality of diamond particles **12b** having a first average mesh size (see, e.g., fig. 15)
- Packing the diamond particles such that each particle is substantially in diamond-to-diamond contact with at least one other particle (see, e.g., pp.25/II.28-pp.26/II.6)
- Providing an interstitial material including Ag, Cu, Al, Si, or BNi₂ (see, e.g., pp.26/II.7-9)
- Bonding the packed diamond particles by the interstitial material such that the interstitial material at least partially fills any voids between the packed diamond particles (see, e.g., pp.22/II.18-24)

6. Regarding claim 4, Ishikawa shows the step of bonding is performed by infiltrating the interstitial material (see, e.g., pp.27/II.9-13).

7. Regarding claim 7, Ishikawa shows that the step of packing the particles further comprises packing the particles to over 50% of the heat spreader prior to the step of providing the interstitial material (see, e.g., pp.26/II.16).

8. Regarding claim 11, Ishikawa shows the particles contacting one another sufficiently to provide a continuous diamond-to-diamond path to substantially each of the particles (see, e.g., fig. 1).

9. Regarding claim 20, Ishikawa shows the interstitial material is selected from the group consisting of Al, Cu, Ag, and mixtures thereof (see, e.g., pp.26/II.7-9).

10. Regarding claim 21, Ishikawa shows the interstitial material may be a Si alloy of a member selected from the group of Ni, Ti, Al, and Cr (see, e.g., pp.22/II.20 and pp.23/II.4,8).

11. Claims 1, 4, 7, 11-15 are rejected under 35 U.S.C. 102(e) as being anticipated by Hall (US 2002/0023733).

12. Regarding claim 1, Hall shows all aspects of the claimed invention including a method of making a diamond composite heat spreader comprising the steps of:

- Providing a first plurality of diamond particles having a first average mesh size (see, e.g., par.0018/II.13)
- Packing the diamond particles such that each diamond particle is substantially in contact with at least one other diamond particle (see, e.g., par.0022/II.29-37)

- Providing an interstitial material including Cu (see, e.g., pars.0023,0029)
 - Bonding the packed diamond particles by the interstitial material such that the interstitial material at least partially fills any voids between the packed diamond particles (see, e.g., par.0025/II.1-8 and par.0023)
13. Regarding claim 4, Hall infiltrates the interstitial material to perform the bonding step (see, e.g., par.0029).
14. Regarding claim 7, Hall teaches the packing step comprising packing the particles to over 50% by volume of the diamond composite prior to the step of providing an interstitial material.
15. Regarding claim 11, Hall shows the diamond particles contacting one another sufficiently to provide a continuous diamond-to-diamond path to substantially each of the plurality of diamond particles (see, e.g., par.0022/II.53-56 and par.0035/II.9-10).
16. Regarding claim 12, Hall shows (see, e.g., figs. 2-3 and par.0022) the method further comprising the steps of:
- Providing a porous ceramic material **17** prior to the step of bonding
 - Placing the ceramic material **17** adjacent to the packed diamond particles prior to the step of bonding
17. Regarding claim 13, Hall shows the ceramic material comprising 100% WC.
18. Regarding claim 14, Hall shows the step of bonding is performed at a pressure between about 4GPa and about 6GPa (see, e.g., par.0022/II.51).
19. Regarding claim 15, Hall shows the diamond particles having a size of from about 18 mesh to about 400 mesh (see, e.g., par.0022/II.1-5).

Claim Rejections - 35 USC § 103

20. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

21. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall in view of Sung (US 6193770).

22. Regarding claims 5 and 6, Hall shows most aspects of the instant invention (see, e.g., paragraph 12 above). Hall, however, fails to specify that the infiltration step is performed at below about 1,100°C in a vacuum furnace at a pressure below 10^{-3} torr.

Sung, on the other hand, teaches an infiltrating temperature below 1,100°C to avoid degrading the diamond particles (see, e.g., col.4/ll.31-34). He further uses pressures below 10^{-3} torr to control the environment for infiltration to provide superior performance (see, e.g., col.13/ll.20-30)

It would have been obvious at the time of the invention to one of ordinary skill in the art to perform the infiltrating step of Hall in a vacuum furnace at a pressure below 10^{-3} torr and a temperature below 1,100°C, as suggested by Sung, to avoid degrading the diamond particles.

23. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall in view of Vereschagin (1382080).

24. Regarding claims 8, Hall shows most aspects of the instant invention (see, e.g., paragraph 12 above). Hall, however, fails to show a step of adding a second plurality of

diamond particles having a second average mesh size smaller than the first mesh size to partially fill the voids between the larger particles to produce a packed collection of diamond between 50%-80% by volume of diamond.

Vereschagin (see, e.g., ll.90-98), on the other hand, teaches that said step would increase the diamond proportion in the composite to a maximum, since voids between coarse diamond particles become filled with the fine diamond particles.

It would have been obvious at the time of the invention to one of ordinary skill in the art to include in Hall's method Vereschagin's step of adding smaller diamond particles to the larger diamond particles to maximize the diamond concentration in the heat spreader.

25. Regarding claims 9 and 10, Vereschagin teaches that the fine particles may be $1/10^{\text{th}}$ the size of the large particles (see, e.g., ll.86-91).

Response to Arguments

26. The applicant argues:

Amended claim 1 requires that the interstitial material includes Ag, Cu, Al, Si, or BNi2. The Hall reference fails to disclose a mass of packed diamond particles bonded together by any of the listed and claimed interstitial materials. Hall does disclose a number of bondable materials which include Cu and Al. However, these are not interstitial materials used to bond the particles together. Rather, these bondable materials pool in a layer on an opposite surface of the spreader.

The examiner responds:

See, e.g., pars.0023, 0025 and 0029, where Hall teaches that some of the copper and cobalt that are infiltrated in the diamond mass remain in the matrix to strengthen the bond between the diamond and the copper layer which is formed on the opposite surface of the matrix.

Conclusion

27. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(571) 273-8300**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

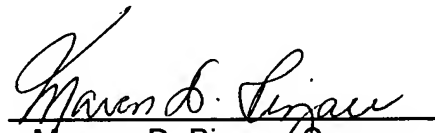
28. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Marcos D. Pizarro-Crespo** at **(571) 272-1716** and between the hours of 10:00 AM to 8:30 PM (Eastern Standard Time) Monday through Thursday or by e-mail via Marcos.Pizarro@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached on (571) 272-1705.

29. Any inquiry of a general nature or relating to the status of this application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Art Unit: 2814

30. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class/Subclass(es): 438/15,25,26,51,55,64,105,106,122,584,FOR413	3/14/06
Other Documentation: PLUS Analysis	4/26/05
Electronic Database(s): EAST (USPAT, EPO, JPO)	3/14/06


Marcos D. Pizarro-Crespo
Patent Examiner
Art Unit 2814
571-272-1716
marcos.pizarro@uspto.gov

MDP/mdp
March 14, 2006